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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/054,424	01/22/2002	Francis P. Wang	DCL1905P1/M4967A	7133

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EXAMINER	
RUTHKOSKY, MARK	

ART UNIT	PAPER NUMBER
1745	

DATE MAILED: 12/12/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/054,424	WANG ET AL.	
	Examiner	Art Unit	
	Mark Ruthkosky	1745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 June 2002*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-30* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *15-30* is/are allowed.

6)☐ Claim(s) *1-14* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *1/22/2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *2*.
4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Priority

The application is a CIP of U.S. application 09/954,280, filed 9/17/2001.

Information Disclosure Statement

The information disclosure statement filed 1/22/2002 has been placed in the application file, and the information referred to therein has been considered as to the merits.

Drawings

The drawings filed on 1/22/2002 have been approved.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1 and 2 are rejected under 35 U.S.C. 103(a) as being unpatentable over Trefilov et al. (PCT/UA94/00018) in view of Gordon et al. (US 5,744,014.)

The instant claims are to an electrochemical cell comprising an anode active material, an aqueous alkaline electrolyte solution, a separator and a cathode comprising copper hydroxide, graphitic carbon and a sulfur additive selected from sulfur and sulfur compounds.

Trefilov et al. (PCT/UA94/00018) teaches an electrochemical cell comprising an anode active material, an aqueous electrolyte solution, a separator and a cathode comprising copper hydroxide 55-85%, graphitic carbon 5-20% and a sulfur additive 1-25%. Zn is noted as being part of the anode on page 9 and Table 5. The electrolyte is an alkali salt in a water solution (examples.) The reference does not teach the electrolyte to be an alkaline electrolyte. Gordon et al. (US 5,744,014), however, teaches an alkaline battery comprising a cathode of copper hydroxide active material with a graphite conductor and a sodium hydroxide additive (column 6.) The references do not teach iron, chromium or mercury. It would be obvious to one of ordinary skill in the art at the time the invention was made to use an alkaline electrolyte in the battery of Trefilov et al. (PCT/UA94/00018), as one of ordinary skill in the art would recognize from the teachings of Gordon that KOH, as used in the reference, functions in an equivalent manner to KCl in order to transfer ionic charge through the aqueous electrolyte solution. One of ordinary skill would use KOH as an aqueous electrolyte in a copper hydroxide cell as it will transfer charge between the anode and cathode as taught by Gordon. The artesian would have found the claimed invention to be obvious in light of the teachings of the references.

Claims 3-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Trefilov et al. (PCT/UA94/00018) in view of Gordon et al. (US 5,744,014) as applied to claims 1-2 and further in view of Mototani et al. (US 5,482,798.)

Trefilov et al. (PCT/UA94/00018) teaches an electrochemical cell comprising an anode active material, an aqueous electrolyte solution, a separator and a cathode comprising copper hydroxide 55-85%, graphitic carbon 5-20% and a sulfur additive 1-25%. The electrolyte is an alkali salt in a water solution (examples.) Zn is noted as being part of the anode on page 9 and in

Table 5. Gordon et al. (US 5,744,014) teaches an alkaline battery comprising a cathode of copper hydroxide active material with a graphite conductor and a sodium hydroxide additive (column 6.) The battery uses an alkaline electrolyte. The references do not teach the graphite to be expanded graphite.

It would be obvious to one of ordinary skill in the art at the time the invention was made to use expanded graphite as the conductive agent in the battery of Trefilov et al. (PCT/UA94/00018), as one of ordinary skill in the art would recognize from the teachings of Treflov that the battery may use a variety of conductors, such as graphite, carbon black, acetylene black or other carbon compounds to conduct electrons from the electrode. Expanded graphite is well described in the art as an electronic conductor in battery electrodes. For example, Mototani et al. (US 5,482,798) teaches an alkaline battery including a manganese/ expanded graphite cathode with the expanded graphite added to conduct electrons through the cathode active material. The reference shows that the materials provide an equivalent means for conducting electrons as both graphite and expanded graphite are used as conducting material. The reference further shows that expanded graphite will increase the battery discharge time as compared with graphite. As the conductor material is not exclusive to the active material, it would be obvious to use expanded graphite in the battery of Trefilov et al. (PCT/UA94/00018) in order to improve the electrically conductive network of the electrode ('798 col. 2, lines 20-60.) The artesian would have found the use of expanded graphite in claimed invention to be obvious in light of the teachings of the references.

With regard to claims 9-10, the reference does not teach at least 90 percent copper hydroxide. The reference teaches 55-85% copper hydroxide and that using amounts outside of

the ranges set forth in the invention will produce a functional battery with a reduction in performance (page 6, lines 15-25.) It would be obvious to one of ordinary skill in the art at the time the invention was made to use a large amount of active material in the battery to increase the capacity of the battery. One of ordinary skill in the art would recognize that a balance of materials is required in a battery electrode with regard to capacity, reactivity and conductivity and the skilled artesian will adjust the relative amounts of the materials to optimize the electrode performance for a desired result. For example, increased capacity will occur with more active material, increased conduction will occur with more conductive agent and increased structural binding of the material will occur with a greater amount of binder.

With regard to claim 12, the reference does not teach copper hydroxide particle sizes between 1 and 100 microns. It would be obvious to one of ordinary skill in the art at the time the invention was made to use active materials with particle sizes on the order of microns, as the general state of the art teaches active materials with particles sizes on the order of microns in order to provide the active material with a relatively large surface area to have increased contact with the additives. As the material will be mixed with a sulfur additive and a conductive material, the use of a material with a greater surface area will allow for increased electronic conduction from the particles in the electrode through the graphite additive and increased reactivity with the sulfur additive.

Allowable Subject Matter

Claims 15-30 are allowed.

The following is an examiner's statement of reasons for allowance:

The instant claims are to an electrochemical cell comprising an anode active material, an aqueous alkaline electrolyte solution, a separator and a cathode comprising copper hydroxide, carbon nanofibers and a sulfur additive selected from sulfur and sulfur compounds. The prior art does not teach an electrochemical cell comprising an anode active material, an aqueous alkaline electrolyte solution, a separator and a cathode comprising copper hydroxide, carbon nanofibers and a sulfur additive selected from sulfur and sulfur compounds. The most pertinent prior art includes the cited references. Trefilov et al. (PCT/UA94/00018) teaches an electrochemical cell comprising an anode active material, an aqueous electrolyte solution, a separator and a cathode comprising copper hydroxide 55-85%, graphitic carbon 5-20% and a sulfur additive 1-25%. Gordon et al. (US 5,744,014) teaches an alkaline battery comprising a cathode of copper hydroxide active material with a graphite conductor and a sodium hydroxide additive (column 6.)

Neither reference teaches an electrochemical cell comprising an anode active material, an aqueous alkaline electrolyte solution, a separator and a cathode comprising copper hydroxide; a sulfur additive selected from sulfur and sulfur compounds and carbon nanofibers as part of the electrode as a conductive material. As the prior art does not teach this combination of materials, the claims are allowed. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Examiner Correspondence

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-1193. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mark Ruthkosky whose telephone number is 703-305-0587. The examiner can normally be reached on FLEX schedule (generally, Monday-Thursday from 9:00-6:00.) If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached at 703-308-2383. The fax number is 703-872-9306.

Mark Ruthkosky
Primary Patent Examiner
Art Unit 1745

12/8/03